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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 14 APR 2005

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Applicant's or agent's file reference FP1776		FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/SG 02/00283		International filing date (day/month/year) 29.11.2002	Priority date (day/month/year) 29.11.2002	
International Patent Classification (IPC) or national classification and IPC H03B5/20				
Applicant INFINEON TECHNOLOGIES AG ET AL.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by 2 ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 03.05.2004		Date of completion of this report 15.04.2005		
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Beasley-Suffolk, D Telephone No. +31 70 340-4251		



**INTERNATIONAL PRELIMINARY REPORT
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Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

2-9	as originally filed
1	received on 21.10.2004 with letter of 07.10.2004

Claims, Numbers

2, 4-10	as originally filed
1, 3	received on 21.10.2004 with letter of 07.10.2004

Drawings, Sheets

1/9-9/9	as originally filed
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- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☒ the entire international application,
☐ claims Nos.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1,3 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos.
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
- | | |
|----------------------------|--|
| the written form | <input type="checkbox"/> has not been furnished |
| | <input type="checkbox"/> does not comply with the standard |
| the computer readable form | <input type="checkbox"/> has not been furnished |
| | <input type="checkbox"/> does not comply with the standard |
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.
- ☐ See separate sheet for further details

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item VIII

The following observations on the clarity of the claims, description and drawings, or on the question of whether the claims are fully supported by the description, are made:

1. Claim 1 contains the phrase [the resistive and reactive elements] "generate an oscillation frequency that dominates at a high frequency range". These elements form part of the loading structure, and therefore cannot generate oscillations themselves. Claim 1 is therefore unclear.
2. The above-mentioned lack of clarity notwithstanding, present claim 1 broadly defines the features solely in terms of their function, which is to extend the linear operating frequency of the oscillator. However, the description (page 4, line 19 to page 5, line 6) and drawings (figure 2) convey the impression that this function can only be carried out in a particular manner, namely by the RC/C load compensation circuit 23, incorporating field effect transistor elements whose resistance changes with a change in their gate voltage, and no alternative means are envisaged. It is also clear that this feature is not present in D1.
3. Further, the description in claim 1 of how the elements of the loading structure operates is not to be found in the description itself. Therefore claim 1 is not supported by the description as required by Article 6 PCT.
4. Similarly, claim 3 broadly defines its features in terms of their function, namely that their values are chosen such that the linear operating frequency range of the current controlled oscillator, and similarly fails to include the features of the load compensation circuit 23 of figure 2 which should also have been included. Therefore claim 3 is not supported by the description as required by Article 6 PCT.
5. As the independent claims 1 and 3 are both unclear, their respective dependent claims are similarly unclear.
6. The following additional comments are appropriate:

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- Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 has not been mentioned in the description, nor has this document identified therein.
- Independent claim 1 has not been presented in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would have been appropriate, with those features known in combination from the prior art (D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- The features of the claims have not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

21. 10. 2004

Current-Controlled Oscillator

(87)

Field of the Invention

5 The present invention relates to current-controlled oscillators and more particularly to a low voltage 3-stage current-controlled oscillator with extended linear gain and low sensitivity to process and temperature variation.

Background of the Invention

10 In recent years the telecommunications industry has increased its demand for improved performance from current controlled oscillators (CCO). For example, when designing phase locked loops (PLL) for frequency synthesizers and clock recovery circuits, it helps to have a CCO with linear gain to allow better modeling during system design. Better modeling during system design helps avoid possible instability problems.

15 Additionally, it is important to reduce the CCO's power consumption and reduce the design margin. This can be achieved by designing the CCO to have low process and temperature sensitivity.

20 Conventional 3-stage ring oscillators of the prior art can have a wide tuning range, but the CCO gain is sensitive to process and temperature variation. The CCO gain is much higher when it works under low temperature, fast-fast (FFL) conditions than it works under high temperature, slow-slow (SSH) conditions. In order to make a conventional CCO oscillate over a certain frequency range, a much larger tuning range is required because of the process and temperature variations. Another problem with conventional CCO's is that the gain will drop, or become flat, at high frequencies, rather than increasing linearly, because of velocity saturation.

25 Figure 1 illustrates a prior art circuit 7 comprising a conventional CCO fully differential inverter cell and its loading. Four pMOS transistors 9, 11, 13, 15 have their drains tied to the voltage Vdd. The gates of the transistors 9 and 15 are both tied to a voltage Vb 19. The voltage Vb 19 is generated from a voltage Vbn 18 through a replica bias. Here, Vbn 18 is the control voltage for controlling the current $I_{control}$. The gate of transistor 11 is tied to the sources of

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21. 10. 2004

Claims

We claim:

(87)

1. A current controlled oscillator comprising:
a first section providing a first differential output;
5 a second section providing a second differential output;
a loading structure comprised of resistive and reactive elements electrically connecting the first differential output with the second differential output, the resistive and reactive elements having values chosen such that the resistive and reactive elements generate an oscillation frequency that dominates at a high frequency range
10 thereby substantially extending the linear operating frequency range of the current controlled oscillator by compensating for velocity saturation effects.
2. The current controlled oscillator of claim 1, wherein the first and second section are comprised of parallel and series connections of transistors.
3. A current controlled oscillator comprising:
15 a first section providing a first differential output;
a second section providing a second differential output;
a loading structure comprised of resistive and reactive elements electrically connecting the first differential output with the second differential output, the resistive and reactive elements having values chosen such that the resistive elements
20 substantially extend the linear operating frequency range of the current controlled oscillator, wherein the loading structure includes transistors and capacitors.
4. The current controlled oscillator of claim 3, wherein the transistors of the loading structure have gates which are tied to ground.
5. The current controlled oscillator of claim 3, wherein the transistors of the
25 loading structure have gates which are tied to a power supply rejection ratio compensation section for compensating for variations in power supply voltage.
6. The current controlled oscillator of claim 5, wherein the power supply rejection ratio compensation section, the first section and the second section are powered by the same power supply voltage and the power supply rejection ratio
30 compensation section includes a diode and a current source.